

Injection/extraction recommissioning

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System changes 2010/2011

- Operational, procedural and SW changes
- HW changes and activities
- Electronics and control changes

Assumptions

- Maximum energy 4.5 TeV in 2011
 - Calibration runs to 5 TeV
 - Clamp voltages to 4.5 TeV
 - MKD cooling setupoint for 4.5 TeV

Operational, procedure and SW changes

- Update LBDS for 4.5 GeV (tracking tables, voltage clamps)
- Update of XPOC data modules, use of BLM ratios
- New IQC functionality (LHCb BCM, TL trajectories, synchro error...)
- New IQC latching philosophy - tbd
- Implement operational settings for MKIs : envelope of trim
- Tighten gap interlocks (energy) for TCDIs/TDIs/TCLIs
- BLM changes (to collate with BLM team)
- Shielding installed for TCDIs and TDIs
- New injection procedure and pulse by pulse modulation requests for intermediate beam
- Interlocking of injection oscillations (SIS)
- TCDI automatic setting up

HW changes and activities

- MKI replacement (probably magnet B at point 2)
- MKD generator consolidation (to run up to 4.5 TeV), as we do during each small tech. stop - exchange of 2 MKD generators
- Normal maintenance without any impact on LHC operation (equipment inspection, measurement of magnet contact resistance, change of one or two terminating resistors on MKI, etc.)
- New TI2 BPMs and dual-plane acquisition for all

Electronics and controls activities

- ALL systems
 - Software upgrade
 - General maintenance
- LBDS
 - New dump triggering IPOC
 - New TSU IPOC
 - TSU firmware upgrade (audit follow-up)
 - Additional MKD internal current diagnostic
 - Update BEM firmware to correct anybus communication errors between BETS and PLC
 - New thermal working point for MKD generator cooling system. Validation required.
- MKI
 - SbS extension (PFN secondary voltages + MAIN switch currents)
 - Increase sensitivity of fast interlock
 - Implement additional diagnostic for KISS monitoring / failure diagnostic
 - Fine synchronisation improvements (reject noise captured from CIBO)
 - Resynchronisation of AGK
 - Deployment of new Kicker Timing Software monitoring KiTS software version with additional diagnostics for timing

Recommissioning

- **Specific tests of all modifications**
 - Will be done as far as possible in system tests
 - Integration tests involving ABT systems:
 - Timing system upgrade: GPS down: no injections; injection sequencer, injection cleaning + soft interlocking strategy, ...
 - Some need fully-connected systems (BIC loops, access, DCCTs, timing, pre-pulse, RF): **estimate 2-3 days of connected checkout needed**
- **System beam tests**
 - **Subset** of full 2010 checks: synchronisation, basic aperture checks, system functionality tests, interlocking checks, steering, protection device setup and validation, asynch dumps, ...
 - Full tests needed in areas where systems have been modified (MKI, MKD, TSU, ...)
 - Specific tests also for 4 – 4.5 TeV (BETS, protection)
 - Abort/injection gap commissioning and full operational deployment
 - Needs full breakdown, but expect that this is **of the order of 12-14 shifts with beam** – to be confirmed before fixing this number
- **Follow-up of intensity increase**
 - Standard tests as beam intensity increases